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AIR QUALITY STUDIES
in the vicinity of
GREAT LAKES CERAMICS INC.
ROSSLYN VILLAGE, ONTARIO
1985-86

Ministry of the Environment
Ontario

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RÉSUMÉ

On a mesuré à l'aide de bougies filtrantes à l'oxyde de calcium le fluorure contenu dans l'atmosphère aux environs de l'usine Great Lakes Ceramics Inc. à Rosslyn. Entre septembre 1985 et la fin de 1986, la concentration a parfois dépassé l'objectif mensuel fixé par l'Ontario. On n'a pas observé de dommages à la végétation. Cependant, la concentration de fluorure dans la végétation dépassait la ligne directrice du Ministère en deux points d'échantillonnage situés hors des limites de l'usine.

INTRODUCTION

From 1977 to 1981, bricks and tiles were manufactured at a plant adjacent to a residential area in Rosslyn Village, on the western outskirts of Thunder Bay. Air quality studies conducted between 1977 and 1982 by the Ministry of the Environment[1] showed that sensitive garden vegetation in residential areas near the plant sometimes sustained minor injury from airborne emissions of fluoride. Airborne fluoride above acceptable limits was also sometimes recorded around the tile plant. For economic reasons, production ceased from 1982 to mid 1985. No vegetation injury was noted after the plant closed at the end of 1981; airborne fluoride also returned to uniformly low levels.

In September 1985, a new company, Great Lakes Ceramics Inc., resumed tile production at the plant and the Ministry resumed measurements of airborne fluoride. In August 1986, vegetation studies were also conducted.

METHODS

Fluoride in air was monitored at six sites (Figure 1) with passive samplers (lime candles) which estimate mean monthly fluoride levels. Results are expressed as fluoridation rate; the maximum acceptable level is 40 µg F/100 cm^2/30 days during the growing season (May to September) and 80 µg F/100 cm^2/30 days during the rest of the year.

Trembling aspen foliage and forage at several locations were collected on August 26, 1987, for fluoride analysis (Figure 2). Standard Ministry sampling and analytical procedures were followed.[2] Samples were analyzed at the Ministry's laboratory in

Toronto. Results were interpreted in relation to the Ministry's contaminant guideline of 15 µg/g for tree foliage and 12 µg/g for forage (grass). Exceedence of the guidelines would suggest that contamination may be present, but would not necessarily imply adverse effects. Vegetation in the vicinity of the study site was also examined for visible evidence of stress caused by disease, insects, contaminants or physiological factors.

RESULTS

AIRBORNE FLUORIDE LEVELS

Monthly lime candle readings for 1985 and 1986 are reported in Table 1. The Ontario air quality objective was exceeded only three times during the 1985/86 period (3% of the samples). Low readings during certain periods (February to May and October to December, 1986) occurred during non-production periods at the tile plant. Fluoridation rates, summarized in Table 2 for 1978-1986, show that average levels in 1985 and 1986 were slightly higher than those in the shutdown period of 1982. Readings prior to 1982, when the plant was in full production, were much higher than 1985-1986 levels.

VEGETATION STUDIES

Injury Symptoms

Trees and Shrubs

As in all previous surveys, there were no fluoride injury symptoms on naturally-occurring vegetation near the tile plant. Light damage to trembling aspen and balsam poplar foliage was caused by leaf-blotch mining insects.

Garden Plants

No symptoms of fluoride injury were observed on foliage of garden plants, including species known to be highly sensitive to fluoride.

Fluoride Levels

Tree Foliage

The highest levels of fluoride in trembling aspen foliage in 1986 occurred on and near company property. Table 3 shows that fluoride levels fell to normal in 1982, after the plant ceased production, then rose slightly in 1986 after the sporadic resumption of tile manufacture. The contaminant guideline for fluoride (15 µg/g) was exceeded in 1986 at one site on plant property and at two off-property locations.

Forage

All forage (grass) samples from three locations in a farm pasture west of the ceramic plant (Figure 2) contained less than 1 µg F/g, dry weight, well below the guideline of 12 µg F/g. Similar values were recorded in 1982, during the shut-down period.

SEVERITY INDEX RATING

An index developed by the Ministry to compare vegetation effects in the vicinity of fluoride-emitting industries[3], was applied to the 1986 data from Great Lakes Ceramics Inc. Table 4 gives the "severity index rating" for Rosslyn since 1978. On a scale of zero to 100 (low to high impact), the 1986 index was only 6, reflecting the low level of emissions from the plant during the 1986 growing season.

SUMMARY AND DISCUSSION

Airborne fluoride, measured by lime candles, occasionally exceeded Ontario's monthly objective from September, 1985 to the end of 1986 in the area around the Great Lakes Ceramics Inc. plant in Rosslyn. No vegetation damage was observed. Fluoride

levels in vegetation, however, exceeded the Ministry's guideline at two off-property sampling sites.

The use of low-fluoride Saskatchewan clay and the intermittent nature of tile production resulted in relatively low fluoride emissions from Great Lakes Ceramics in 1985 and 1986. Assuming that the company continues to operate, the Ministry will continue appropriate monitoring to determine the requirement, if any, for an abatement program.

REFERENCES

1. Racette, D. J. and H. D. Griffin. 1984. Air quality studies in the vicinity of Thunder Tile Limited, Rosslyn, 1982.

2. Ontario Ministry of the Environment. 1983. Field investigation procedures manual. Phytotoxicology Section, Air Resources Branch.

3. Pearson, R. G. 1978. Summary report on brick, tile and ceramic assessment surveys, 1976-77. Ontario Ministry of the Environment.

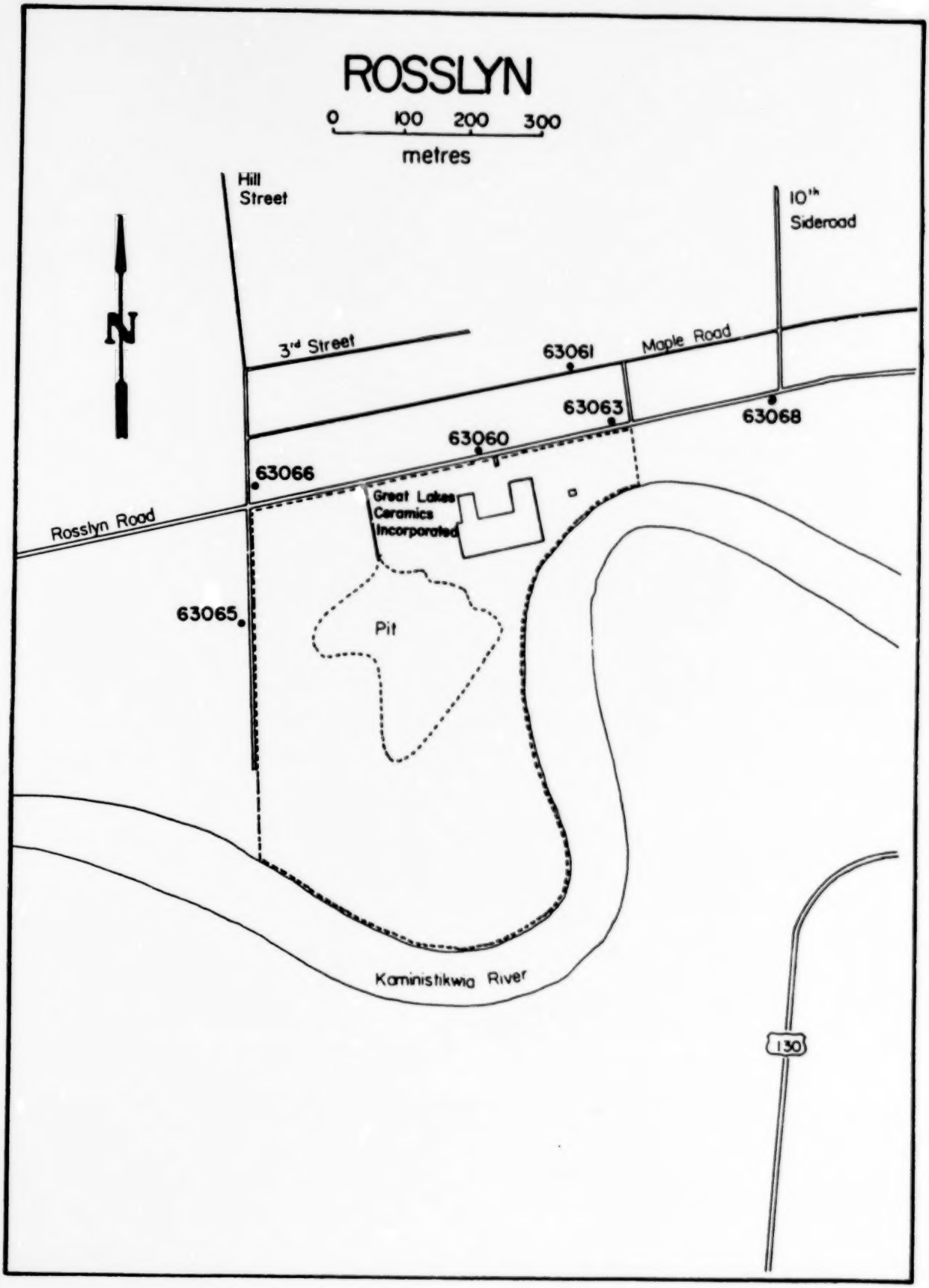

Figure I. Lime candle monitoring sites, Rosslyn.

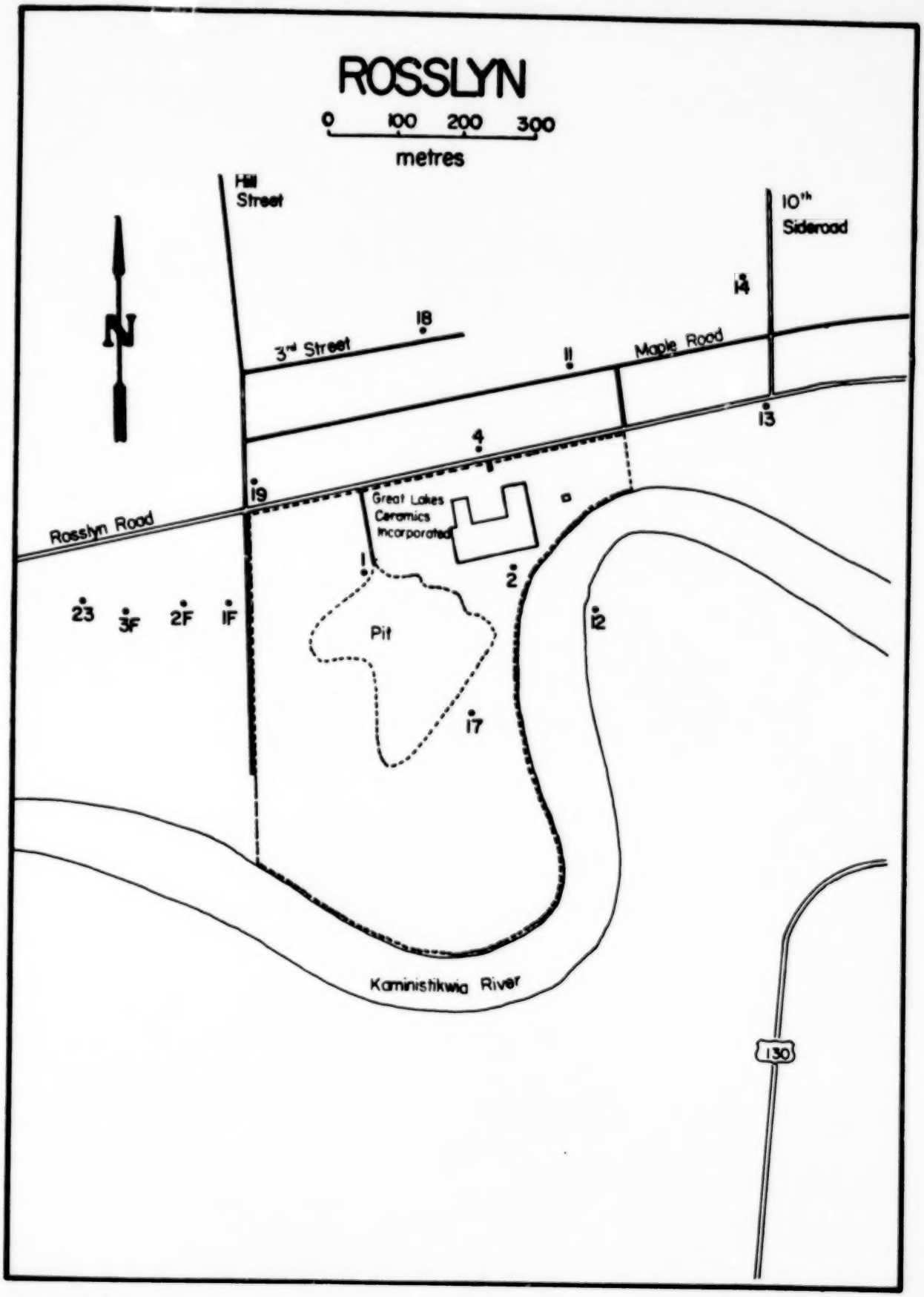

Figure 2. Trembling aspen and forage sampling sites, August 26, 1986. (IF designates forage)

TABLE 1. Fluoridation rates (µg F/100 cm^2/30 days), Rosslyn Village, 1985-1986.

Station	Location	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
		1985												
63060	Rosslyn Village	-	-	-	-	-	-	-	-	80*	29	38	5	38.0
63061	Maple Road	-	-	-	-	-	-	-	-	52*	21	16	5	23.5
63063	Fire Hall	-	-	-	-	-	-	-	-	9	18	11	14	13.0
63065	Hill Street	-	-	-	-	-	-	-	-	<5	7	13	<5	6.3
63066	Hill St./Rosslyn Rd.	-	-	-	-	-	-	-	-	5	13	9	5	8.0
63068	Rosslyn Rd./10th Side Rd.	-	-	-	-	-	-	-	-	<5	13	11	11	11.0
		1986												
63060	Rosslyn Village	69	6	5	4	9	34	49*	11	27	2	4	<1	18.4
63061	Maple Road	34	3	4	2	6	36	36	10	22	1	2	<1	13.0
63063	Fire Hall	41	2	-	1	6	18	35	8	-	1	1	<1	11.4
63065	Hill Street	41	1	4	4	3	5	11	3	6	<1	1	<1	6.7
63066	Hill St./Rosslyn Rd.	35	<1	4	2	2	3	6	2	4	<1	<1	<1	5.0
63068	Rosslyn Rd./10th Side Rd.	37	3	4	1	4	13	14	4	5	1	<1	<1	7.3

* Exceeds air quality objectives of 40 µg F (May-September), or 80 µg F (October-April).
- Missing value

TABLE 2. Average annual fluoridation rates (μg F/100 cm^2/30 days), Rosslyn Village, 1978-82, and 1985-86.

Station	1978[a]	1979	1980	1981	1982	1985[b]	1986
63060	124	98	122	196	7	38	18
63061	133	-	73	94	6	24	13
63063	165	94	51	96	4	13	11
63065	98	131	25	38	3	6	7
63066		40	16	21	3	8	5
63068		41	25	31	3	11	7
Percent objective exceedences	78	47	33	43	0	8	1

[a] 9 months data
[b] 4 months data

TABLE 3. Levels of fluoride (µg/g, dry weight) in trembling aspen foliage, Rosslyn Village, 1977-82 and 1986.

Site	1977	1978	1979	1980	1981	1982	1986
1[a]	110	170	36			<5	5
2[a]	38	50	150	320	510	<5	47
4	33	240	89	200	210	<5	21
11		120	53	90	120	<5	12
12		81	70	15	79	<5	64
13		20	20		18	<5	3
14		19	16	25	20		1
17[a]			25	20	36	<5	5
18			39	20		<5	3
19			34	33	26	<5	1
23			17	20	41	<5	5
Controls	4	<3	<3	12	8	<5	<1
Contaminant guideline	15	15	15	15	15	15	15

[a] Sites on company property.

TABLE 4. Fluoride "Severity Index Rating", Rosslyn Village, 1978-82, and 1986.

	1978	1979	1980	1981	1982	1986
Severity index	51	46	54	55	0	6

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